Course Syllabus
MBSB 504 TECHNIQUES IN SYSTEMS BIOSCIENCES
Academic Year 2021

Course ID and name: MBSB 504 Techniques in Systems Biosciences

Course coordinator: Dr. Kittiphong Paiboonsukwong
Email: Kittiphong.pai@mahidol.ac.th
Assist. Prof. Phatchariya Phannasil
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Dr. Alita Kongchanagul
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Instructors:

1. Assoc. Prof. Panat Anuracpreeda
2. Assist. Prof. Alisa Tubsuwan
3. Assist. Prof. Duangrudee Tanramluk
4. Assist. Prof. Phatchariya Phannasil
5. Assist. Prof. Narisorn Kitiyanant
6. Dr. Alita Kongchanagul
7. Dr.Chutima Thepparit
8. Dr.Duangnapa Kovanich
9. Dr.Kittiphong Paiboonsukwong
10. Dr.Natee Jearawiriyapaisarn
11. Dr. Promsin Masrinoul

Credits: 2(0-6-2)
Curriculum: Doctor of Philosophy Program in Systems Biosciences (Required course for Plan 2.2)
Semester offering: Year 1/ Semester 1
Prerequisite: None
Course level: Intermediate

Course Description:
Research methodology; basic statistics for research; genomic DNA extraction; DNA amplification by PCR, DNA cloning, plasmid extraction; mammalian cell culture; transfection; RNA extraction, RT-PCR, and RT-qPCR; protein analysis; microscopic techniques; immunocytochemistry; flow cytometry; high throughput technology; immunoassay; bioinformatics; imaging technology; laboratory animal handling.

Course Learning Outcomes (CLOs)
Upon completion of this course, students are able to:

1. Describe principle and limitation of the techniques in molecular biology
2. Apply and analyses comprehensive knowledge in molecular biosciences or related disciplines to do scientific research
3. Develop their own research questions, systematically formulate hypotheses to answer the question and select the appropriate technique to do research to answer the questions.
4. Respond to critical feedback, and seek to make scientific information understandable to scientists, peers, and the general public in both a written and oral format.

Course Schedule 2021
Date: Monday-Friday,
Time 09:00-16:00
On-site Lab at Institute of Molecular Biosciences, Mahidol University

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Thu 19 May 2022	09.00-10.00	Course Orientation	1	Demonstration	Kittiphong Paiboonsukwong
	10.00-12.00	Biosafety and Chemical Safety	2	Demonstration	Kittiphong Paiboonsukwong
	13.00-16.00	Gene editing by Crispr/Cas	3	Experiments	Alisa Tubsuwan and team
Mon 23 May 2022	09.00-12.00	DNA cloning I: Construction guide RNA	3	Experiments	Natee Jearawiriyapaisarn, and team
	13.00-16.00	DNA cloning II: Bacterial transformation and plating	3	Experiments	Natee Jearawiriyapaisarn, and team
Tue 24 May 2022	09.00-12.00	Mammalian cell culture	3	Experiments	Chutima Thepparit and team
	15.00-16.00	DNA cloning III: Bacterial colony picking	1	Experiments	Natee Jearawiriyapaisarn and team
Wed 25 May 2022	09.00-12.00	DNA cloning IV: Plasmid Extraction	3	Experiments	Natee Jearawiriyapaisarn and team
	13.00-16.00	Transfection	3	Experiments	Chutima Thepparit and team
Thu 26 May 2022	09.00-12.00	Flow cytometry	3	Experiments	Narisorn Kitiyanant and team
	13.00-16.00	Genomic DNA Extraction	3	Experiments	Kittiphong Paiboonsukwong and team
Fri 27 May 2022	09.00-12.00	PCR	3	Experiments	Kittiphong Paiboonsukwong and team
	13.00-16.30	T7EI Assay	3	Experiments	Kittiphong Paiboonsukwong and team
Mon 30 May 2022	09.00-12.00	RNA Extraction	3	Experiments	Phatchariya Phannasil and team
	13.00-16.00	cDNA synthesis	3	Experiments	Phatchariya Phannasil and team

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Tue 31 May 2022	09.00-12.00	qRT-PCR	3	Experiments	Phatchariya Phannasil and team
	13.00-16.00	Immunocytochemistry I	3	Experiments	Alisa Tubsuwan and team
Wed 1 Jun 2022	09.00-12.00	Immunocytochemistry II	3	Experiments	Alisa Tubsuwan and team
	13.00-16.00	Confocal microscopy	3	Experiments	Narisorn Kitiyanant and team
Thu 2 Jun 2022	09.00-12.00	Advance Imaging technology	3	Demonstration	Narisorn Kitiyanant and team
Mon 6 Jun 2022	09.00-12.00	Protein Extraction	3	Experiments	Alita Kongchanagul and team
	13.00-16.00	Immunoprecipitation	3	Experiments	Alita Kongchanagul and team
Tue 7 Jun 2022	09.00-12.00	Western Blot I	3	Experiments	Promsin Masrinoul and team
	13.00-16.00	Western Blot II	3	Experiments	Promsin Masrinoul and team
Wed 8 Jun 2022	09.00-12.00	Western Blot III	3	Experiments	Promsin Masrinoul and team
	13.00-16.00	Western Blot IV	3	Experiments	Promsin Masrinoul and team
Thu 9 Jun 2022	09.00-12.00	Mass spectrometry I	3	Demonstration	Duangnapa Kovanich and team
	13.00-16.00	Mass spectrometry II	3	Demonstration	Duangnapa Kovanich and team
Fri 10 Jun 2022	09.00-12.00	High throughput technology I	3	Demonstration	Natee Jearawiriyapaisarn and team
	13.00-16.00	Bioinformatics	3	Demonstration/Hand on Practice	Duangrudee Tanramluk and team

Date	Time	Topics/Details	Number of hours	Class activity/ Teaching media	Lecturer
Mon 13 Jun 2022	09.00-12.00	Advance technology I	3	Demonstration	Panat Anuracpreeda and team
	13.00-16.00	Advance technology II	3	Demonstration	Panat Anuracpreeda and team
Wed 15 Jun 2022	09.00-12.00	Student presentation	3	Presentation	All staffs

Assessment Criteria

Assessment Criteria	Assessment Method	Scoring Rubric
Laboratory report/ Lab notebook 50%	(1) Lab notebooks	(1) Writing style (2) Report sending (3) Presentation of data (4) Data analysis and Conclusion (5) Lab notebook
Class participation, Group presentation, Group assignment 50%	(1) Direct observation Short presentation	(1) Class participation (2) Group work (3) Assigned work sending Group presentation

Students must receive a score of 60% or more to pass the course. Student's achievement will be graded using symbols: A, B+, B, C+, C and F based on the following criteria;

Percentage	Grade	Description
≥ 80%	A	Excellent
75-79.99%	B^+	Good
70-74.99%	B	Fairly good
65-69.99%	C^+	Fair
60-64.99%	C	Poor
< 60%	F	Fail

However, a final grade will be adjusted based on frequency distribution of student's scores from the whole course.

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
1. Writing Style (4%)	Report was neat and well organized with minimum spelling error.	Report was neat and appropriately organized with a few spelling errors.	Report was somewhat neat and organized with some spelling errors.	Report was disorganized with many spelling errors.
2. Report Sending (2%)	Report was sent on time.	Report was sent one day late.	Report was sent two days late.	Report was sent more than two days late.
3. Presentation Of Data (4%)	Experimental data was clearly presented with tables, diagrams, pictures or graphs that effectively present the experimental data. Showed clear detail of results and graphical data were labeled accurately.	Experimental data was presented in an appropriate format with only a few minor errors or omissions. Showed clear detail of results and graphical data were labeled accurately.	Experimental data was presented in an appropriate format but some significant errors were noticed. Some tables, graphical data could be better organized. Some units, labels, and titles were missing.	Experimental data was poorly presented. Graphs or tables were poorly constructed with several errors. Data was missing or incorrect. Some units, labels, and titles were not included.
4. Data Analysis and Conclusion (4%)	Reasonable scientific explanations for the results were discussed and logically analyzed. Conclusion was well written with a complete answer to the question or hypothesis. Provided description of what was learned, possible sources of error, good suggestions for improving the experiment and application.	Scientific explanations for the results were given. Conclusion was appropriately written with a possible answer to the question or hypothesis. Provided description of what was learned, possible sources of error, suggestions for improving the experiment and application.	Scientific explanations for the results were given but not complete or accurate. Conclusion was written with inaccurate answer to the question or hypothesis. Description of what was learned, possible sources of error, suggestions for improving the experiment and application were missing.	Scientific explanations for the results were given but not complete or accurate. Conclusion was poorly written with inaccurate answer to the question or hypothesis. Description of what was learned, possible sources of error, suggestions for improving the experiment and application were missing.

Lab Report/ Lab notebook Evaluation Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
5. Lab notebook (6%)	Lab notebook was complete including procedure for each experiment, calculation, results and conclusion.	Lab notebook was sufficiently complete with only minor omissions.	Lab notebook had partial information with major omissions.	Lab notebook was incomplete and difficult to understand.
Total (20 %)	**Total points earned =**			

Class participation, Group presentation, Group assignment Rubric				
Criteria	**Excellent (4)**	**Good (3)**	**Satisfactory (2)**	**Needs to Improve (1)**
1. Class participation (5 %)	Used time well in class and focused attention on the lecture and experiments. Actively participated in the group and in classroom discussion.	Used time pretty well. Stayed focused on the lecture and experiments most of the time. Usually provided useful ideas when participating in the group and in classroom discussion.	Focused on the class but did not appear very interested. Sometimes provided useful ideas when participating in the group and in classroom discussion.	Participation was minimal. Rarely provided useful ideas when participating in the group and in classroom discussion.
2. Group work (5%)	Shared a lot of work with others. Gave ideas and helped others to complete the assigned work.	Shared equal work as others. Gave ideas and completed the assigned work in the group.	Did almost as much work as others. Sometime gave ideas and asked for help from others.	Did less work than others. Did not give ideas or ask for help from others.
3.Assigned work sending (5%)	Completed assigned work on time.	Completed assigned work one day late.	Needed some reminding; work was late but no more than two days.	Needed much reminding; work was late more than two days.
4.Group presentation (5%)	The presentation was well organized, and easy to follow. All of the group members contributed equally to the presentation.	The presentation had good organization. Everyone gave some presentation but someone gave more contributions than others.	The presentation could be better organized. Certain people did not do as much work as others.	The presentation lacked organization. A few people or only one person worked on the presentation.
Total (20 %)	**Total points earned =**			

Appeal Procedure

Should the students have any appeal regarding the assessments or grade, inquiry can be made to the instructors and/or the course coordinator immediately either by direct contact, telephone or email.

General Inquiry

Ms. Siriporn Monkasemsiri e-mail: siriporn.mon@mahidol.edu; Tel. 02-441-9003-7 ext. 1314

Date revised: April 12 2022